Toxic Chemicals Update

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In This Issue:

Research on Toxicity of Pesticides and Nonylphenol on American Lobster

The Environment Canada Laboratory in Moncton, NB is partnering with Fisheries and Oceans Canada and other partners to determine the toxic effects of low environmentally realistic concentrations of pesticides and nonylphenol on growth, moulting, histology, gene expression, behaviour and survival of American lobster (*Homarus americanus*) larvae in a series of acute and chronic laboratory exposures. The study is funded for three years under the Fisheries Science Collaborative Program.

American lobster catches in the Gulf of Saint Lawrence have recently been in decline. There are many possible reasons for this, including large-scale environmental changes, fishing pressures, or adverse effects of anthropogenically introduced contaminants. The current in-use pesticides atrazine, azinphosmethyl, chlorpyrifos, diflubenzuron, endosulphan, hexazinone, methamidiphos and tebufenozide, and nonylphenol were chosen for study as they are used in areas adjacent to the Gulf of Saint Lawrence, and there is potential for their entry into coastal waters in the Gulf Region. If these chemicals are present in the environment in sufficient quantities, and at the right time, the potential for effects on lobster populations exists.

Other partners in this study are the Homarus Inc., the Maritimes Fisherman's Union, Atlantic Microarray Facility, and the Université de Moncton. Preliminary results of this study were presented at the 32nd Annual Aquatic Toxicity Workshop, 2-5 October 2005, Waterloo, Ontario, Canada, and will be presented at the SETAC North America 27th Annual Meeting in Montréal (5-9 November 2006).

Fig 1: General view of stage IV larval lobster (*Homarus americanus*) (A1: 1st Antenna, A2: 2nd Antenna, E: eye, P1: 1st Periopod (cheliped),C: Carapace, A: Abdomen, T: Telson).

Fig 2: Lab staff in Moncton set up chronic exposure experiments

Contact Ken Doe, Environment Canada, at 506-851-3486; or Wayne Fairchild, DFO, at 506-851-2056

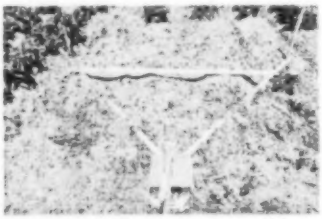
Fish Processing Plant Effluent Assessment

The first meeting of the national Fish Processing Plant Effluent Assessment Working Group was held in Ottawa, Nov 9. Presently represented on the Steering Group are: Canadian Food Inspection Agency; Fisheries and Oceans Canada; Dalhousie University; University of New Brunswick; Fisheries Council of Canada. Environment Canada leads the Steering Group. The assessment will take place over the next three years and will determine the environmental risks associated with effluents from fish processing facilities across Canada and to determine possible mitigative measures. The effort will focus on characterization of fish processing plant effluents, extending work that has been focused on Atlantic Region plants to other parts of the country, measuring the impacts in receiving environments and exploring some pollution reduction techniques. As part of the project, a questionnaire will be sent soon to the approximately 1100 plants across the country to begin a database on processing plant characteristics.

For further information on this project, please contact Benoit Lalonde at (902) 426-2295 or benoit.lalonde@ec.gc.ca

Agricultural Watercourse Buffer Effectiveness Study Continues

The Toxics and Inventories Section has continued to pursue buffer effectiveness work in Prince Edward Island following receipt of renewed 3-year funding from the Pesticide Science Fund (PSF). The purpose of the buffer work is to determine whether provincially legislated buffer zones are protective of aquatic life in PEI. Buffer effectiveness is determined by collecting runoff water at the edge and various distances downslope of potato fields after substantial rain events. Collected water is analysed for toxicity, water quality parameters and pesticide concentrations. Previous work has indicated that 10-meter buffers are effective at reducing pesticide concentrations but not always to non-lethal levels for aquatic species. Sparse data beyond 10 meters has made it difficult to ascertain what buffer width would be appropriate for both fields with shallow slopes (*i.e.* < 5%) and those with

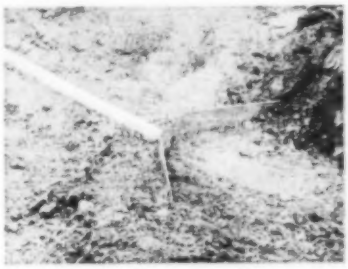


steeper slopes (*i.e.* > 5%) mandated to have a 20-meter buffer. As such, current and future PSF-supported work will focus on developing the database beyond 10 meters. To this end, two fields were chosen for the 2006 season and triplicate sample collectors were located at 0, 10, 20, 25, and 30 meters for runoff collection. Sampling was conducted after 7 rainfalls events; toxicity and pesticide analyses are pending. With the addition of replicate sample collectors at distances beyond 10 meters, the research team's long term objective is to make recommendations regarding appropriate buffers for shallow and steep sloped fields.

Model Validation Work Underway

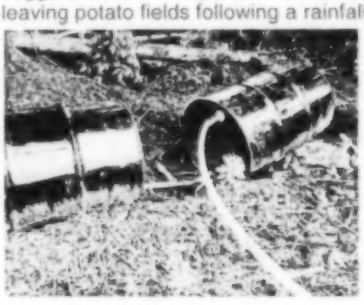
Results of the buffer work will also be used to validate existing surface runoff models. To date, validation work has been undertaken for two surface water runoff models using the PEI buffer data set as a point of comparison. Several data limitations hindered the initial validation work and resulted in low correlations between predicted and measured pesticide concentrations. Consequently, efforts are being made to collect more field-specific data for the buffer study sites to better characterize their hydrology, erosion potential and pesticide fate and thereby improve runoff model performance. Soil cores were taken for the current season and field-specific pesticide sorption and soil half-lives for selected actives will be determined for each field. Validation work will be undertaken for a selection of runoff models with the aim to find a suitable model that predicts well for the PEI environment. Once a suitable model is chosen, it will be recommended to the relevant regulatory bodies for the establishment of protective buffer zones.

Runoff Contribution from Sprayer Tracks



A new study was undertaken by the Toxics and Inventories section in collaboration with Bedeque Bay Environmental Management Association in PEI. Anecdotal evidence gathered from the previous buffer work suggested sprayer track rows (*i.e.* selected rows the tractor drives on numerous times per season to deliver pesticide applications) contribute a large proportion of the water and pesticide load leaving potato fields. To investigate this theory, a runoff project was established in 2006 to measure the amount of runoff and pesticides leaving sprayer track rows compared to normal drills and sprayer track rows treated with a management practice (*i.e.* track elimination). Following rainfall events, the volume of runoff water from the 3 treatments was measured and samples were submitted for toxicity and pesticide analysis.

Qualitative evidence from this season suggests that the majority of runoff water leaving potato fields following a rainfall is



from compacted sprayer track rows. Changes will be made to the sample collector design next year to allow for optimal flow and complete water volume collection. Further, collaborative work with the PEI's Department of Agriculture, Fisheries and Aquaculture is being considered to better coordinate our efforts in the study of runoff from potato fields.

For more information regarding the project, contact Gary Julien (902-4264486) or Allison Dunn (902-426-5037).

Chlorothalonil Concentrations in Air near Potato Fields in Prince Edward Island

From 2003 to 2005 Environment Canada, Atlantic Region conducted a study to measure and evaluate concentrations of a commonly-used fungicide, chlorothalonil, in air near potato fields in Prince Edward Island. Chlorothalonil is

one of only two pest control products sold on the Island in quantities greater than 50,000 kg, the other being mancozeb, also a fungicide. Chlorothalonil has been measured previously in ambient air more frequently and in higher concentrations than any other pesticide, triggering the need for more detailed investigation.

Over the three-year duration of the project a total of 16 spray applications on 5 different potato fields were sampled. Sampling was conducted using Tisch Environmental Total Suspended Particulate (TSP) high volume air samplers equipped with a glass fibre filter and a polyurethane foam/XAD resin "sandwich" housed in an aluminum canister. Samples were collected at sites located 0m, 30m and 100m from the downwind edge of the target field and were taken at four separate time intervals (pre-spray, during spray, 1h post spray and 2h post spray). Meteorological information including wind direction, speed, and turbulence, air temperature and relative humidity were measured on site at 5 minute intervals during sampling.

Results indicated that concentrations of chlorothalonil decreased exponentially with time and with distance from the field. However, samples collected at 1h and 2h

post spray remained significantly higher than corresponding pre-spray samples. Therefore air concentrations of chlorothalonil remain elevated for at least 2 hours after application. Pre-spray samples were considered to be background concentrations of the pesticide, as they were collected at least seven days after the previous application to the field. Chlorothalonil was detected in most of the pre-spray samples at concentrations were comparable with ambient studies of 1998/99, indicating that chlorothalonil is present in ambient air PEI most times of the day during the spraying period.

Concentrations measured during spray were higher than any other similar studies, however even the maximum concentration measured in PEI (0m, during spray) was lower by 3 orders of magnitude than existing ambient air quality guidelines and calculated inhalation toxicity thresholds (calculated from oral toxicity data). No long-term mammalian inhalation toxicity studies have been conducted on chlorothalonil.

For more information regarding the project, contact Christine Garron (Christine.garron@ec.gc.ca)

National Pollutant Release Inventory (NPRI) Update

The data for the calendar year 2005 is currently available on the NPRI website: http://www.ec.gc.ca/pdb/npri/npri_home_e.cfm. The reporting requirements for the 2005 reporting year were very similar to the 2004 reporting year. As part of the 2004 NPRI reporting year, facilities were given the option of completing their NPRI report online and the vast majority of reporting facilities elected to complete and submit their reports via the online system. The capability of the online system, One Window to National Environmental Reporting System (OWNERS) was expanded in 2005 reporting year to accept reports for the Greater Vancouver Regional District (GVRD). OWNERS now collects information for the NPRI, GVRD and the Ontario Ministry of Environment (MOE). Discussions continue between the NPRI and its partners and potential partners, the Ontario Ministry of the Environment, British Columbia Ministry of Environment, Lands and Parks, Greater Vancouver Regional District, Alberta Environment, Environment Canada's Environmental Emergencies Regulations and Environmental Performance Agreements, The Province of Quebec, the Canadian Chemical Producers' Association to further enhance the one window approach for environmental reporting. The aim of these discussions is to allow facilities to submit reports to all of the partners' programs through a single reporting form, eliminating the need to update frequently-requested information for each program. OWNERS was operational in early 2005. Development and enhancement of the OWNERS system is continuing.

The 2006 NPRI reporting requirements were outlined in a *Canada Gazette* notice published in February 2006. Changes to the reporting requirements for the 2006 reporting year include increases in the number of reportable substances, the inclusion of portable facilities and the exemption of pits and quarries. Substances have been added to the NPRI substance list to facilitate harmonization of reporting with the MOE. For the 2006 reporting year 341 substances are listed, quantities of these substances released onsite, recycled, disposed of onsite and disposed of off site by industrial facilities in 2006 must be submitted to Environment Canada on or before June 1, 2007. This data will be released to the public as quickly as possible after June 1.

For More information on the NPRI please visit the web site at www.ec.gc.ca/npri/

Or contact the Atlantic Region at:
NPRI_ATL@ec.gc.ca
Jeff Stobo (902) 426-4805

Contaminant concentrations and biomarker changes in wild mussels near finfish aquaculture facilities and municipal/industrial activities in the Lower Bay of Fundy

An investigation of the potential for endocrine disruption, the incidence of leukemia, and the contaminant levels in bivalve molluscs near finfish aquaculture sites in southwest Nova Scotia and New Brunswick was undertaken in November and December 2002. Wild blue mussels (*Mytilus edulis*) and sediments were collected near finfish aquaculture areas, municipal waste water sites, industrial sites (ferry terminal, pulp mill, fish processing plant), as well as areas for which large point source discharges could not be identified. Collection sites were located in the lower Bay of Fundy, along the Annapolis Basin in Nova Scotia, as well as in Passamaquoddy Bay, NB and its surrounding areas. Mussel condition indices were different between sites, with some of the highest condition indices found at aquaculture sites ($p < 0.001$). Metals in soft tissues were not elevated above those found at less impacted areas and among organics only (PCB's, chlordane, DDT and its derivatives) were found to be slightly elevated at the ferry station, pulp mill and fish plant sites.

While leukemia rates were undistinguishable from background rates in NS, there were elevated levels of leukemic cells near the areas of anthropogenic activity in NB. These areas of anthropogenic activity included the aquaculture sites, sewage treatment plant, ferry station, pulp mill and fish plant. Estrogenicity in sediments was measured by estradiol activity using the YES (yeast estrogen screen) assay was low (generally less than 15% and often less than 5%) for both less impacted and treatment sites in water-extracted sediments. Analysis of vitellogenin-like proteins (vitellins) in soft mussel tissue revealed significant differences in vitellin levels between sites. Also, values were lower at treatment sites than the less impacted sites with the exception of the sewage treatment site. The sewage treatment site showed increased levels of vitellogenin-like proteins and gametogenic activity as determined by aspartate transcarbamoylase activity. The discovery of significant differences between sites warrants further investigation to verify changes to the health status of mussel populations.

For further information, please contact Bill Ernst; Bill.ernst@ec.gc.ca

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North American Soil Geochemical Landscapes Project

The need for baseline soil geochemical data to effectively assess and manage natural resources and the risk of environmental hazard is well recognized. This tri-national initiative between US, Canada and Mexico is being designed to understand of the amount and origin of variation in soil geochemistry and establish a consistent methodology for determining these characteristics. For Canada, this project is being lead by Natural Resources Canada with in-kind support being provided by Environment Canada, Health Canada, Agriculture Canada and several provincial departments of natural resources.

A 40 km x 40 km grid has been overlaid on the whole of North America and a single soil sample from a random, pre-

selected site within each 1,600 km^2 area will be collected, resulting in a total of approximately 10,000 soils samples being collected from the three countries. As part of the international efforts to support this project, EC – Atlantic will assist in the collection of over 100 soil samples throughout Nova Scotia, New Brunswick, and Maine in the summer of 2007, as per established sampling protocol. The analytical results of these samples will also compliment the background soils database that EC-Atlantic is developing for the region.

The data collected through this endeavour will significantly contribute to our ability to identify and quantify changes in soil composition caused by urbanization, industrialization, agriculture, waste disposal, and other natural and anthropogenic activities.

For further information on this project, please contact Rita Mroz at (902) 426-9064 or rita.mroz@ec.gc.ca

LEGISLATION UPDATE

REVISIONS TO THE *CHLOROBIPHENYLS REGULATIONS* AND THE *STORAGE OF PCB MATERIAL REGULATIONS*

Environment Canada is developing recommendations for updating the polychlorinated biphenyl (PCB) regulatory framework under the *Canadian Environmental Protection Act, 1999*. This process entails considering new developments based both on updated technologies and on Canada's national and international commitments to PCB management.

EC published the proposed *PCB Regulations* in Canada Gazette Part I on November 4th, 2006 to improve the protection of Canada's environment and the health of Canadians from the risks posed by the use, storage and releases of PCBs and to accelerate their elimination. The proposed Regulations also implement Canada's national and international commitments on the use (including exports and imports), storage and elimination of PCBs. While incorporating most of the existing requirements of the *Chlorobiphenyls Regulations* and the *Storage of PCB Material Regulations*, proposed changes include specific deadlines for ending the use of PCBs and destroying PCBs in storage and introduce new labeling requirements and provisions for reporting the destruction of PCBs in storage and contained in equipment in use. These proposed requirements are in line with Canada's international commitments to end the use and storage of PCBs. An opportunity for public comments is currently taking place ending on January 4th, 2007.

REVISIONS TO THE *FEDERAL MOBILE PCB TREATMENT AND DESTRUCTION REGULATIONS*

Revisions under consideration by Environment Canada are technical in nature. Updated and more stringent emission limits would be set for PCB treatment and destruction systems operated on federal or on aboriginal land or under contract with federal institutions in order to further mitigate the risks posed by PCB wastes.

A consultation document was published in June 2006 to outline the objectives, structure, and content of the proposed revisions to the *Federal Mobile PCB Treatment and Destruction Regulations* in the context of the updated framework. The next opportunity to comment on the proposed revisions will be following the publication of the provisions in the *Canada Gazette*, Part I.

REVISIONS TO THE *INTERPROVINCIAL MOVEMENT OF HAZARDOUS WASTE REGULATIONS*.

Environment Canada is developing recommendations for updating the regulatory framework under Part 7, Division 8 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999) to repeal and replace the *Interprovincial Movement of Hazardous Waste Regulations*. The proposed Regulations are required as a consequence of the requirements under section 189 of CEPA 1999 and the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (EIHWHRMR), which came into force on November 1, 2005.

The proposed Regulations ensure coherence with respect to the new definitions of hazardous waste and hazardous recyclable material, and the movement document (formerly known as the manifest and maintained to track the movements of hazardous waste and hazardous recyclable materials) introduced in the EIHWHRMR.

The proposed Regulations have been published in *Canada Gazette*, Part I and public consultations ended on November 1st, 2006. For additional information regarding these regulations, please contact Ms. Marie-Josée Sirois at (902) 426-3574 or by e-mail at marie-josee.sirois@ec.gc.ca, or visit the CEPA Environmental Registry website at http://www.ec.gc.ca/CEPARegistry.

CATEGORIZATION

As in the United States and European countries, Canada screens all new chemical substances before allowing their manufacture or import. Canada has been doing this since 1994. However, many chemical substances were introduced prior to that time. Many of these older, or "existing substances," have not been examined by environmental and health scientists in government.

The *Canadian Environmental Protection Act, 1999* (CEPA 1999) requires that all 23,000 existing substances be sorted or "categorized" to determine which need further attention.

In September 2006, Canada completed this scientific evaluation. The information is being used to focus on those chemical substances of highest priority.

For more information;
http://www.chemicalsubstanceschimiques.gc.ca/categor/index_e.html

Note to Readers:

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Toxic Chemicals Update is published by the Toxics and Inventories Section of Environment Canada, Atlantic Region.

Editor:
Benoit Lalonde
Environment Canada
16th floor, Queen Square
45 Alderney Drive
Dartmouth, NS
B2Y 2N6
Tel: (902) 426-2295
Fax: (902) 426-8373